PREPRODUCTION INITIATIVE-NELP
PARTICLE CONTAMINATION MONITOR
TEST PLAN

SITE: NAS NORTH ISLAND AND NS MAYPORT

1.0 OBJECTIVE

This test plan describes the data collection procedures for acquiring performance data on two particle counter models, analyzing the data in conjunction with conventional patch test data of the same fluid sample over a multitude of samples, and evaluating the units to obtain the particulate measurements of aircraft hydraulic fluid in lieu of the present patch test method.

2.0 DESCRIPTION

Currently, aircraft hydraulic fluid particulate contamination is determined using the patch test method defined in NAVAIR 01-01A-17. This method is time-consuming, requires solvents, generates waste, and requires a subjective decision. Thus, particle counters are being evaluated to determine whether these units are more effective than the current method.

Synthetic aircraft hydraulic fluids MIL-H-83282 (Hydraulic Fluid, Fire-Resistant) and MIL-H-46170 (Hydraulic Fluid, Rust-Inhibited, Fire-Resistant) are the primary fluids to be measured.

3.0 TEST PLAN

This test plan defines procedures for acquiring test data, which will be used to evaluate the performance of two particle counter systems—HYAC/ROYCO 8011 and Diagnetics Digital Contam-Alert (dCA). Although each system uses a different technology for measuring particulates, the test plan procedures apply to both.

3.1 Approach

The HYAC/ROYCO 8011 will be used to measure contaminant levels in MIL-H-83282 hydraulic fluid used in aircraft and the A/M27T-5 hydraulic power supply. The dCA system will measure MIL-H-46170 hydraulic fluid used in hydraulic test stands. Although these are the fluids intended for use in the particle counters at this Aircraft Intermediate Maintenance Department (AIMD) activity, they can be interchanged because each particle counter is capable of measuring particulate in either fluid.

Fluid samples will be measured using the particle counters, and the results will be correlated with the results obtained from the conventional patch test using the same fluid sample.

3.1.1 Requirements

- **Particle Counter:** The particle counter shall be within its calibration cycle and operated by qualified personnel.

- **Fluid Sample Bottle:** The following containers are acceptable for fluid collection:

  – **Flint Glass Bottle:** National Stock Number (NSN) 8123-00-543-7699

  – **Plastic Sample Bottle:** Part Number (P/N) XX6504709 (from Contamination Analysis Kit, P/N 57L414)

  Fluid samples shall be drawn from a clean sampling port on the equipment or from a fabricated reservoir.

- **Waste Receptacles:** The following shall be kept in separate receptacles:

  – Waste hydraulic fluid
  – Waste hydraulic fluid-containing solvent
  – Waste solvent.

3.1.2 Procedures

The following procedures describe how to collect fluid test samples from a sample port. Procedures are also provided for testing fluid samples using particle counters. Data related to these samples will be used to evaluate the performance of the particle counters compared to patch tests.

Procedure for Taking Hydraulic Fluid Samples from Sampling Ports (*e.g.*, A/M27T-5 Hydraulic Power Supply)

1. Determine the fitting to be used as a sampling port.

2. Prepare the sample port as follows.

   a. Remove dirt and other external contaminants from the sampling point by washing it with cleaning solvent P-D-680, Type II. Dispense the solvent from a non-filtered wash bottle. Wipe the sampling point clean using disposable wiping cloths.

   b. When the sampling port is visibly clean and free of external contaminants, perform a final solvent wash using the wash bottle. Allow it to dry.

3. Before sampling the support equipment hydraulic system fluid, recirculate the fluid within the system for a minimum of 5 minutes at full flow (or proportionally longer at a lower flow rate).

4. To collect a fluid sample, follow these procedures.

    a. Remove the specimen label from the previous fluid sample.

    b. Drain the sample bottle of any hydraulic fluid remaining from the previous sample into a waste receptacle or use a new sample bottle. Do not rinse the sample bottle with solvent.

    c. Initiate the flow of hydraulic fluid from the sampling port of the hydraulic supply. Allow a purge quantity of approximately five times the stagnant volume to flow into a waste receptacle.

    d. Rinse the sample bottle with system fluid. After purging the dead volume, fill it half-full with fluid collected from the sampling port. Cap the bottle and shake it for at least 1 minute. Drain the bottle into the waste receptacle.

CAUTION: Sampling ports and bottles that are inadequately cleaned will result in erroneous test results, which may cause the system to fail the test.

    e. Without interrupting the fluid flow from the sampling port initiated in step d, fill the rinsed sample bottle to its appropriate level, remove it from the fluid stream, and cap the bottle. Do not completely fill the sampling bottle.

        - **Fluid Level for Flint Glass:** Approximately 1 inch (25 mm) below the shoulder

        - **Fluid Level for Plastic Bottle:** Approximately 1/4 inch (6 mm) below the shoulder

    f. Terminate the fluid flow from the sampling port.

    g. Turn off the power supply system's main engine.

    h. Wipe the exterior of the capped bottle using isopropyl alcohol, or equivalent, and let dry.

    i. Affix a tag to the filled sample bottle that identifies the following:

        - The date the sample was taken
        - Equipment nomenclature from which the sample was taken (*i.e.,* AIMD work center or squadron)—including unit identification code (UIC)
        - Point of contact (POC) and phone number

    j. Analyze the hydraulic fluid drawn from the sample port for particulate contamination. Enter the results in Table 1.

    k. Complete the data entries requested in Table 1 and as described in section 3.1.3.

5. Complete all remaining data entries requested in Table 1 and as described in section 3.1.3.

Procedures for Personnel Performing Particle Counter Testing

1. Calibrate the particle counter using the procedures set forth by the manufacturer and at the frequency recommended by the manufacturer.

2. Visually inspect the fluid sample. Fluid with visible particles or visible evidence of water should be rejected because visibly contaminated hydraulic fluid can clog and damage the sensor, leading to incorrect data on subsequent samples.

3. Shake the sample bottle vigorously for a minimum of 1 minute.

4. Measure the particle count following the manufacturer's instructions.

NOTE: The HYAC/ROYCO 8011 particle counter is sensitive to air bubbles. Follow the manufacturer's procedures for removing air bubbles to avoid erroneous particle counts.

5. Perform a particle count analysis on the sample fluid from the same sample bottle using patch test contamination kit P/N 57L414. Drain waste fluids into the appropriate receptacles.

6. Compare the results obtained from the particle counter and from the patch test analysis. If they do not agree, the patch test results shall take precedence.

7. Record all test data in Table 1.

8. Return the emptied sample bottle to the originator.

3.1.3 Instructions for Completing Table 1

- **Sample Number:** Indicate sample number.

- **Sample Date:** Indicate the dates the fluid sample was taken (month/day/year).

- **Work Center:** Indicate the center performing the task.

- **Equipment Nomenclature:** Describe the hydraulic supply from which the sample was drawn.

- **Particle Counter:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less ("pass") or greater than class 5 ("fail"). Indicate the presence/absence of water.

- **Patch Test:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less ("pass") or greater than class 5 ("fail"). Indicate the presence/absence of water.

- **Test Date:** Record the date when the fluid particulate was measured using a particle counter and/or a patch test (month/day/year).

- **Point of Contact (POC):** List the POC and the technician responsible for measurement.

- **Qualitative Assessment:** Provide a brief narrative evaluation of the abilities of the particle counter and particle contamination monitor. Briefly discuss:

  - Efficiency of the method (*e.g.,* time and cost savings)
  - Ease of use and the unit's ability to successfully interface with site operations
  - Overall satisfaction.

3.1.4 Supplemental Data

Supplemental data required for the evaluation includes the prevailing temperature and relative humidity measured at the station during the process. Both of these affect the time required for reducing the amount of dissolved water in the hydraulic fluid.

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Sample Number	Sample Date	Work Center	Equipment Nomenclature	Particle Counter	Patch Test	Test Date	POC	Prevailing Temperature	Relative Humidity

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

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*Attach extra sheet if required